

STORMWATER FACILITY MAINTENANCE MANUAL

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Introduction

Background

All businesses and government agencies have some form of stormwater drainage facilities. Stormwater facilities or storm sewers on private sites drain to roadside ditches, county storm sewer pipes, streams, or to groundwater from infiltration facilities. Storm sewers include pipes, catch basins, manholes, grassy treatment swales, ditches, drywells, ponds, oil/water separators, and any other structures that collect, convey, control, or treat stormwater.

New requirements from the federal Clean Water Act and compliance with rules to protect threatened salmon under the federal Endangered Species Act also require that all storm drainage facilities be properly operated and maintained.

In November 1998, Clark County adopted the Water Quality Ordinance (as Chapter 13.26A CCC). The Water Quality Ordinance requires businesses and public agencies to use water quality protection practices, referred to as best management practices or BMPs, to eliminate or reduce pollution from their outdoor activities. The Water Quality Ordinance was amended in July 2000 to include minimum standards for maintaining drainage facilities. Development under Chapter 13.29 CCC is also required to maintain storm sewers. New facilities are either transferred to county ownership and maintenance or maintained by the owner as private facilities.

Purpose

This manual is intended to meet all storm sewer systems operation and maintenance requirements under Clark County Code Chapter 13.26A Water Quality and Chapter 13.29 Stormwater Controls. It applies to county operations, as well as public or privately owned and operated systems in unincorporated areas of Clark County.

Drainage systems are often in or near areas that are also fish and wildlife habitat. This manual helps make sure that storm sewer owners perform their maintenance in a way that conforms to regulations protecting fish and wildlife.

Why Maintain Storm Sewer Facilities?

Along with keeping the site from flooding, properly maintained storm sewers can help reduce surface water and groundwater pollution. Many newer sites have stormwater control facilities designed to limit the environment damage and flooding damage by stormwater runoff. These systems cost many thousands of dollars to install and require more maintenance than a system of pipes and catch basins.

Storm sewer maintenance is necessary to protect streams, lakes, wetlands, and groundwater. Proper maintenance helps assure that:

- Storm sewers operate as they were designed;
- Storm sewers are cleaned of the pollutants that they trap, such as sediment and oils, so that the site's storm sewers are not overwhelmed and become pollutant sources;
- Sources of pollutants to storm sewers (such as leaky dumpsters) are removed.

What You Should Be Doing

This manual describes the steps you can take to assure that your storm sewers meet water quality requirements. If your site was approved for construction under the current Clark County Stormwater Control Quality Ordinance, the storm sewer system should have an approved plan for maintenance. This new manual will help follow those requirements.

Where to Find More Information on Storm Sewer Maintenance and Water Quality Best Management Practices

Contact the Clark County Public Works Department at 397-6118, extension 4094 for more detailed information and assistance in finding plans or reports specific to your facilities. You may also call the Clark County Community Development at 397-2375, extension 4258 for information about stormwater site plans. These plans are included in covenants and Technical Information Reports from county stormwater facility construction requirements.

Look for electronic copies of the manual on the Clark County web site:

www.co.clark.wa.us.

Method for Creating this Manual

This manual draws on other maintenance manuals to create a new manual for Clark County storm sewers. Along with documenting current county standards and practices, the manual includes maintenance practices from the Stormwater Management Manual for the Puget Sound Basin (Washington Department of Ecology, February 1992), the Oregon Department of Transportation Water Quality and Habitat Guide (June 1997), and the King County Road Maintenance BMP Manual (September 1998). The main sources are:

- Oregon Department of Transportation (June 1997) Maintenance BMPs for Water Quality and Habitat
- Association of Water Quality Agencies (June 1998) Oregon Toolbox
- King County (September 1998) Appendix A, Private Facilities Maintenance Requirements
- City of Portland, Parks and Recreation Bureau, April 1999, Waterways Pest Management Policy
- Washington Department of Ecology (February 1992) Stormwater Management Manual for the Puget Sound Basin
- Washington Department of Transportation (February 1995) Highway Runoff Manual
- Clark County Drainage Facilities Maintenance Standards and Practices

- Clark County NPDES stormwater management program (April, 1999)
- Clark County Public Works internal assessments of activities affected by the ESA (spring 1999)
- Draft Tri-County 4(d) Stormwater Management proposed maintenance standards

County stormwater managers reviewed the manual for completeness and usability. The manual also underwent public review prior to adoption.

Manual Layout

The manual lists stormwater facilities and some general maintenance activities such as vegetation management.

For each stormwater facility or activity, this manual:

- Briefly describes the facility or activity.
- Lists the water quality and non-water quality outcomes for each facility or activity.
- Lists the practices or BMPs to meet the water quality and general maintenance requirements.

Additional information may be found in other manuals such as the King County Surface Water Design Manual or the Washington Department of Ecology's Stormwater Management Manual for the Puget Sound Basin.

Stormwater Facilities or Activities

Stormwater facilities are specific drainage features such as catch basins, pipes, ditches, ponds, and biofiltration swales. Activities are maintenance tasks associated with operating and maintaining stormwater facilities such as vegetation management and small repair projects.

Outcomes

Stormwater facilities maintenance is performed to meet desired outcomes. Maintenance desired outcomes are specified for each drainage feature or activity. They include maintaining performance and appearance of the facility, and the need to prevent maintenance work itself from becoming a pollutant source or damaging habitat.

The Water Quality Outcomes are:

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O3 Avoid or minimize vegetation removal
- O4 Preserve native plants

The Infrastructure Maintenance Outcomes are:

- O5 Protect public safety and health
- O6 Prevent catastrophic infrastructure failures
- O7 Maintain or restore the intended infrastructure function

- O8 Prevent or reduce flooding
- O9 Protect infrastructure
- O10 Meet public expectations for aesthetics

Operation and Maintenance Practices

The maintenance and water quality best management practices are necessary to meet the water quality and infrastructure maintenance outcomes for each feature or activity.

Some operations may be able to handle storm sewer maintenance themselves. Often, property owners contract for maintenance. Landscapers are often employed to maintain vegetated facilities such as swales and pond areas. Heavier work, like cleaning catch basins or drywells often requires special equipment such as trucks that can vacuum sediment. A limited number of contractors perform this type of work Check phone book listings such as sewer contractors and cleaning, tank cleaning, and environmental and ecological services. Check with the contractor to ensure that all materials are disposed of according to solid waste and hazardous materials regulations. Ultimately, the generator of the waste or hazardous material is responsible for proper disposal.

Storm Sewer Facilities Operation and Maintenance

Special Facilities Maintenance Requirements

This manual provides a set of minimum standards and practices for maintaining stormwater facilities. Manufactured stormwater facilities such as leaf compost filters and oil/water separators often have maintenance requirements and manuals specified or written by the manufacturer. Also, larger or more complex stormwater facilities may include specifications for maintenance and vegetation management that provide specific detail above this manual.

Manufacturer or Designer's Maintenance Manuals

Where the Public Works Director determines that manuals or plans provide equal or greater level of maintenance and water quality protection, they shall be followed by the owner. These individual maintenance plans, specifications, or manuals must be approved by the Public Works Director. Review of the manuals and plans should include a county engineer, senior maintenance staff and, if available, the manual preparer.

One of a Kind Facilities

The director may require development and implementation of a site-specific maintenance plan for complex or unusual facilities. The plan is required when the general provisions of this manual do not provide sufficient detail for inspection, maintenance, vegetation management, and repair practices to operate the facility.

Catch Basins and Inlets

Catch Basins trap sediment and some oils that can pollute water bodies. They need to be inspected and cleaned annually to remove accumulated sediment, fluids, and trash.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect catch basins at least once per year.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Act to have the pollutant source removed.

Cleaning

Clean catch basins when they become one third full to maintain sediment-trapping capacity. Catch basin and manhole cleaning should be performed in a manner that keeps removed sediment and water from being discharged back into the storm sewer.

Clean putrid materials from catch basins when discovered or reported.

Keep the inlet cleared of debris and litter.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Materials Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according the manufacture's instructions.

Repairs

Repair any damages that prevent the catch basin from functioning as designed. An example is broken or missing outlet elbow.

Follow the practices described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Debris Barriers/Trash Racks

Trash racks are barred covers to pipe openings. They prevent large objects from entering pipes and keep pets and people out of pipes. In cases where there is fish migration, maintaining unblocked trash racks allows fish passage.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O5 Protect public safety and health
- O6 Prevent catastrophic infrastructure failures
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect trash racks at least once per year.

Cleaning

Clean trash racks when debris is plugging more than 20 percent of the openings or when obstructions to fish passage are created. Consult the Washington Department of Wildlife if in a fish-bearing drainageway.

Repairs

Immediately replace missing racks and missing bars.

Replace bars that are deteriorated to the point where they may be easily removed.

Bend bent bars back into position.

Follow the practices described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Energy Dissipaters

Energy dissipaters are critical for preventing erosion at storm drain outfalls. There are a variety of designs including wire gabion baskets, rock splash pads, trenches, and specially designed pools or manholes.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended "infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect at least once per year.

Cleaning

Dispersion Trench:

Remove sediment from pipe when it reaches 20 percent of pipe diameter.

Repairs

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Rock Pads:

Replace missing or moved rock to cover exposed soil and meet design standards.

Dispersion Trench:

Repair conditions that cause concentrated flow along the trench.

Clean pipe perforations when one half of them are plugged or if flows bypass or overflow the trench.

Manhole/Chamber:

When the structure deteriorates to one half its original size or it becomes structurally unsound, replace it to the design standards.

Fences, Gates, and Water Quality Signs

Stormwater facilities such as detention ponds or treatment wetlands often have fences to protect them from damage and keep children away from ponds or hazardous areas. Certain facilities such as biofiltration swales, approved under Chapter 13.29 CCC, are also required to have informational signs telling the public that the swale is a stormwater facility.

Outcomes

- O5 Protect public safety and health
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect fences, gates, and water quality signs when facilities are maintained.

Repairs

Repair any opening that allows entry into the facility.

Close any opening that allows access beneath a fence

Replace any missing gates.

Repair broken gate hinges or gates which do not close and lock properly.

Replace any missing signs or signs that have more than 20 percent unreadable surface. Signs are available from the Clark County Department of Community Development at 1408 Franklin St. in Vancouver.

Repair sign posts that lean more than 8 inches off vertical.

Access Roads and Easements

Many stormwater facilities have access roads to bring in heavy equipment for facility maintenance. These roads should be maintained for inspection access and ease of equipment access.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

Practices

Inspection

Inspect once a year or when facilities are maintained.

Cleaning

Remove litter when mowing or litter accumulation exceeds one cubic foot (about one and a half five-gallon buckets) per 1,000 square feet.

Remove any debris that blocks roads or may damage tires.

Vegetation Management

Manage vegetation as for the rest of the facility. Trees and shrubs may be removed from access roads and easements if they block access for necessary maintenance or will prevent or harm intended stormwater facility function.

Repairs

Correct any bare or eroded soils by seeding or cover BMP.

Repair road surfaces when they may lead to erosion or limit equipment access.

Manholes

Manholes are large cylindrical vaults usually set at storm sewer pipe connections. Unless you have OSHA approved training and equipment, never enter a manhole. There is a considerable risk of poisonous gas and injury.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Inspect the manhole once per year. Check the frame and lid for cracks and wear, such as rocking lids or lids moved by traffic.

Periodically inspect the manhole and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

Clean manholes when there is a blockage of a water flow path. Cleaning should be performed in a way that ensures removed sediment and water is not discharged back into the storm sewer.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Materials Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Replace broken parts or lids that rock or are moved by traffic.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Oil/Water Separators and Buried Wet Vaults

An oil/water separator is an underground vault that treats stormwater by mechanically separating oil from water. The oil rises to the surface and floats on the water and sediment settles to the bottom. Buried wet vaults are similar to oil/water separators in that they are sub-surface vaults that separate sediment and floating materials from stormwater.

These facilities have special problems for maintenance and should be serviced by contractors. The main issues are working in confined spaces and properly handling any sludge and oil cleaned from vaults or oil/water separators.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Practices

Inspection

Periodically check stormwater flow out of the facility. It should be clear and not have a thick visible oil sheen.

Annually check for cracks large enough to let soil enter the vault, broken or defective plates and baffles, and crushed or damaged pipes.

Periodically inspect the surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Inspect water levels after an extended dry period to check for leakage.

Cleaning

Remove trash and litter from the vault, inlet and piping.

Remove oil when it reaches one-inch thickness.

Remove sediment when it accumulates to 6 inches depth.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for

Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are present. Repair any leaks that allow water levels to drop and cause oil to be washed from the unit.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

StormFilte™ (Leaf Compost Filter)

The StormFilter is a patented system for treating stormwater. The systems have evolved during the last 10 years from very simple above ground filter beds to a variety of vault devices containing cylindrical filters filled with leaf compost pellets. StormFilter facilities consist of cartridges filled with one or a combination of media. Media can be selected to target pollutants specific to a particular site. The cartridges are housed in pre-cast or cast in place concrete vaults or in a steel catch basin configuration. Each configuration uses baffles to promote settling of solids and separation of oils and other floatable materials. The majority of pollutants are captured by the media and held in the cartridges. Some additional settling will occur in the inlet and cartridge bays of each vault. Most of the units in Clark County contain cartridges.

The manufacturer has a detailed maintenance manual for these facilities. That manual should be used. The following practices are general requirements.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Practices

Inspection

Inspect the StormFilter every six months. The inspection should determine sediment depth and the specific maintenance and repairs needed.

Annually check for cracks large enough to let soil enter the vault, broken or defective plates and baffles, and crushed or damaged pipes.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

Remove trash and litter from the vault, inlet and piping.

Remove sediment when it accumulates to 6 inches depth in settling chambers.

Remove sediment when it accumulates on filter media.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer--cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted 'in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils; are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Return used compost or canisters to the manufacturer for proper disposal or dispose of them in the garbage as solid waste.

Repairs

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are found.

Replace media cartridges if it takes longer than an hour for water to empty through media or if water frequently overflows the treatment chamber. Replace defective cartridges.

Repair all security and access features so they are fully functional. This includes locking manhole lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Catch Basin Inserts

Catch basin inserts are becoming more widely used to trap sediment and oil entering catch basins. Most involve some type of filter media and oil-absorbent pads. Filters avoid flooding by overflowing when they become clogged or there are high storm flows.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Practices

Inspection

Inspect following the manufacturer's specifications. During the wet season (October through April), inserts should be inspected once every two weeks. Two-week inspection can determine if a longer inspection interval is appropriate at a specific site. During the dry season, inspect them at least every two months.

If inserts are used for trapping sediment on a construction project, they should be inspected after every major storm.

Periodically inspect the catch basin and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

Generally, the filter media is removed, then cleaned or disposed. It is easier to remove the filter after it has drained and dried. If this is not possible, consider contracting the service or de-watering the filter in a container.

Remove trash and litter from the filter.

If discharges have an oily sheen, replace the oil-trapping media. If the oil trapping media is full, remove it and replace it with a new one or if manufacturer's specifications allow, clean and replace it.

If sediment clogs media, clean it following manufacturer's specifications or replace the filter.

Material Handling

Persons handling used filters should wear rubber gloves and safety protection.

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be handled and disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Replace any media after typical service life.

Stormwater Biofiltration Swales

Biofiltration swales use grass or other dense vegetation to filter sediment and oily materials out of stormwater. Usually they look like flat-bottomed channels with grass growing in them. Swales are stormwater treatment devices that must be properly maintained to sustain pollutant removal capacity.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

Practices

Inspection

Swales are easy to inspect and need to be well maintained to treat stormwater. Make frequent visual inspections for problems such as channeling flow, rills, bare ground, sediment and oily material.

Identify and remove pollutant sources discharging to the swale.

Cleaning

Clear inlets and outlets to prevent blockage.

Remove litter when mowing or litter accumulation exceeds one cubic foot (about one and a half five-gallon buckets)

Use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick that cover grass areas, avoiding vegetation removal.

Vegetation Management

Mow to keep grass at the optimum height (6 inches). Mow to no less than 4 inches height and a minimum of four cuttings per year.

Remove clippings from the treatment area in the base of the swale. Clippings may be raked or blown onto the side slopes. If the swale has vertical walls or no side-slopes, the clippings must be removed.

Preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots.

Use cover BMPs on bare soils. BMPs include hydroseeding or mulches.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for more information.

Repairs

Often swales have problems due to flooding or erosion. Where possible, correct the underlying problem before trying to repair the symptom.

Level spreaders must be in proper working order for swales to function properly. Where level spreaders are damaged, sunken, or bypassed by erosion, repair them to design standard.

If there is a problem with grass dying due to the swale being flooded during the wet season, there are two options: convert the swale to plant varieties that can stand being flooded or find a way to fix the swale so it drains better. Call the Public Works Department at 397-6118, extension 4094 for information on plants and possible swale modifications.

Wet Biofiltration Swales and Treatment Wetlands

Wet biofiltration swales and treatment wetlands use dense wetland vegetation and settling to filter sediment and oily materials out of stormwater. These stormwater treatment devices must be properly maintained to sustain pollutant removal capacity. In some cases, biofiltration swales that were designed to drain between storms remain wet and need to be rebuilt or converted to wetland swales. A designed wet biofiltration swale uses wetland plants instead of grass.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

Practices

Inspection

Swales are easy to inspect and need to be well maintained to treat stormwater. Make frequent visual inspections for problems such as bare ground, sediment and oily material.

Identify and remove pollutant sources to the swale.

Cleaning

Clear inlets and outlets to prevent blockage.

Remove litter and trash when accumulation exceeds one cubic foot (about one and a half, five gallon buckets) per thousand square feet.

Where possible, use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick in 10 percent of the treatment area.

Vegetation Management

Sparse vegetation or dense clumps of cattail do not properly treat stormwater. Try to find the cause of the problem and fix it to ensure dense vegetation. Cut back excessive cattail shoots. Normally, wetland vegetation does not need to be harvested unless there is an excessive die back that causes water quality problems.

If there is a problem with grass dying due to the swale being flooded during the wet season, there are two options: plant varieties that can stand being flooded or find a way to fix the swale so it drains better. Call the Public Works Department at 397-6118, extension 4094 for information on plants and possible swale modifications.

Outside of the treatment area, preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots. Use cover BMPs on bare soils.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for more information.

Repairs

Often swales have problems due to flooding or erosion. Where possible, correct the underlying problem before trying to repair the symptom.

Repair any defect that causes the wet swale to dry out during the wet season.

Replace stormwater facility signs that are broken, damaged, or stolen.

Filter Strips

Filter strips are linear strips of grass that remove sediment and oils from stormwater by filtering it. Stormwater is treated as it runs across the filter. Usually, filter strips are placed along the edge linear paved areas such as parking lots and roads. Where designed filter strips are installed; road shoulders should only be graded to maintain level flow off the road.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

Practices

Inspection

Filter strips are easy to inspect and need to be well maintained to treat stormwater. Make frequent visual inspections for problems such as bare ground, sediment and oily material.

Identify and remove pollutant sources.

Cleaning

Clear inlets and outlets to prevent blockage.

Remove litter when mowing or litter accumulates.

Use a rake and shovel to hand remove sediment accumulations greater than 2 inches thick that cover grass areas, avoiding vegetation removal. Remove sediment to re-level the slope to an even surface so that water spreads and does not form channels.

Vegetation Management

Mow to keep grass at the optimum height (6 inches). Mow to no less than 4 inches height and a minimum of four cuttings per year.

Remove clippings from the treatment area. They may be spread elsewhere on site where they will not reenter the stormwater facility.

Preserve healthy vegetation or reestablish vegetation where needed. Seed bare spots.

Use cover BMPs on bare soils.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not used. See Vegetation Management in Stormwater Control Facilities for details.

Repairs

Where possible, correct the underlying problem before trying to repair the symptom.

The flow spreader must be level and spread flow evenly across the filter. Immediately repair any defects in the flow spreader.

If ruts develop, fill them with coarse soil, level the surface and reseed.

Sand Filters

Sand filters treat stormwater by filtering it through a bed of sand into an under-drain beneath the sand. They are effective at removing pollutants but must be carefully designed and well maintained. Sand filters may have serious maintenance problems in sites with excessive sediment. Along with normal maintenance, the filter media needs replacement periodically. Consult engineer's operation manual written for the sand filter or have a licensed professional engineer assist in media replacement.

Sand filters are either above ground and open to view or below ground in vaults. Above ground filters are much easier to maintain. Below ground units require special training and equipment approved by OSHA for any work.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O10 Meet public expectations for aesthetics

Practices

Inspection

Above ground filters are easy to inspect and need to be well maintained to treat stormwater. Make frequent visual inspections for problems such as overtopping or bypasses, taking longer than 24 hours to draw down, and channels. Make a complete inspection of all features at least once a year.

Underground units must be inspected for all features at least once per year. More frequent inspections should be performed as a part of routine site maintenance. Check for indicators that the facility is not functioning. Examples include checking stormwater effluent for oil sheen, checking for overflowing, and checking for short circuiting.

Identify and remove pollutant sources.

Cleaning

Clean out accumulated sediment when it accumulates to 1/2 inch depth.

Remove any trash or litter from the sand bed and other parts of the facility. Rake up and remove accumulations of leaves or other plant debris that wash into the facility and begin to form a mat.

Clean sediment out of pre-settling chambers when 6 inches of sediment accumulates.

Clean out any drain pipes or clean outs that become filled with sediment.

Vegetation Management

Above ground sand filters may, or may not be designed with a vegetation surface. If a facility has vegetation, follow the maintenance procedures for a stormwater biofiltration swale.

If it does not have designed vegetation, mechanically remove vegetation before it begins to cover parts of the facility.

Remove all clippings or pulled weeds from the facility.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Where possible, correct the underlying problem before trying to repair the symptom.

If it takes more than 24 hours for a storm to drain through the sand media or it frequently overflows, the sand media needs to be serviced. This problem is caused by fine particles clogging the sand filter. Have a licensed professional engineer oversee this procedure. At the very least, the upper few inches will need to be replaced. Sieve analyses may be helpful for determining the depth that needs to be removed and replaced with new sand. Replace clogged sand with the type of sand specified by the designer or approved by a Public Works Department Engineer.

If there are prolonged, low-rate flows into the facility due to groundwater seeps or detention facilities route them to a smaller part of the facility using a low wood divider or shallow channel.

The flow spreader must be level and distribute flow evenly across the filter. Immediately repair any defects in the flow spreader.

If parts of the sand filter erode, find ways to correct the problem by compacting the sand or protecting the eroding area with geotextile or other means.

Replace or repair any damaged pipes.

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are found.

Repair any joints that are cracked and allow soil into the facility.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Detention Ponds

Detention facilities are designed to hold and slowly release stormwater by use of a pond and specially designed control structure. Styles vary greatly from well manicured to natural appearing. Generally, more natural-appearing vegetation is preferred for reduced maintenance and wildlife habitat. Some facilities are designed to appear as natural water bodies or are in park-like areas.

Some older facilities are built in stream channels and require special permits such as an HPA from the Washington Department of Fish and Wildlife.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O3 Avoid or minimize vegetation removal
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O10 Meet public expectations for aesthetics

Practices

Inspection

Identify and report pollutant sources to the facility. Inspect the facility for oil and other pollutants and remove any pollutants greater in volume than a surface sheen.

Cleaning

Trash is removed when it exceeds 1 cubic foot per 1000 square feet.

Remove sediment when it accumulates to 10 percent designed pond depth.

Cleaning or excavating stormwater facilities within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses (e.g., Curtin Creek, China Ditch, etc.) may also require an HPA. Consult the official state DNR water type maps for assistance in determining whether watercourses are typed streams (e.g., type 1, 2,3,4 or 5) that are regulated by WDFW. Contact WDFW Region Five office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Region Five Vancouver Office (360) 696-6211, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for

Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Vegetation Management

Where a facility has natural area, vegetation management should be timed to avoid or minimize impacts on wildlife. An example is facilities used by breeding birds such as red-winged black birds.

Mow or control vegetation to match surrounding area or sustain any other intended use of the facility, such as wildlife habitat or recreation.

Stormwater control facilities are, in effect, water body buffers in which pesticides and fertilizer are not used.

Use mechanical methods to control weeds. Pesticides, herbicides and fertilizers are not used in stormwater control facilities. See the activity: Vegetation Management in Stormwater Control Facilities for more information.

When replacing plantings, use only plants on the list of adopted Clark County Plant List (Ordinance. 1995-01-26) or Vancouver plant list inside Vancouver.

Trees should not be allowed to grow on emergency overflows and berms that are over 4 feet high. Trees can block flows and roots can lead to berm failure. Remove any trees. Remove larger roots (where the base of the tree is greater than 4 inches) and restore the berm.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Repairs

Repair and seed bare areas. Repair eroded slopes when rills form, where the cause of damage is present, or there is potential for future erosion. Use cover BMPs on exposed soils.

Level spreaders must be in proper working order to function properly. Where level spreaders are damaged, sunken, or bypassed by erosion, repair them to design standard.

Rodent holes on a dam or berm can pipe water. Destroy the rodents, preferably by trapping, and repair the darn or berm. Check with the Washington Department of Fish and Wildlife before removing a game animal or far-bearer, for example muskrat, beaver, and nutria.

Repair the liner if it is visible and repair or replace where there are more than three holes greater than ¼-inch diameter.

If berms or dams show signs of settlement or sinkholes, serious problems may be occurring. Consult a licensed professional engineer to determine the cause of the settlement or sinkhole.

Spillway areas should be completely covered by more than one layer of rock.

Drywells

Drywells are perforated, open-bottomed manholes used to infiltrate stormwater into the ground. While not the intended use, drywells trap sediment and some of the oily pollutants in runoff. Drywells are more likely to fill with oily sediment in areas that lack swales or other treatment facilities. Fine oil sediment can clog drywells and lead to localized street flooding. Also, pollutants discharged into drywells can migrate into groundwater. Drywells were often installed in closed topographic depressions, areas with well-drained soils, or areas having inadequate storm sewers. Often, drywells contain groundwater.

Because drywells can be easily clogged and tend to concentrate pollutants in one place; pollution and sediment control practices should be used to protect them.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Drywells should be inspected at least once a year and no less than once every five years.

Periodically inspect the drywell and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

If a problem with flooding or slow drainage occurs, observe or inspect the drywell for infiltration rate and observe water level depths if monitoring wells are installed.

Cleaning

Clean out drywells when sediment depth is greater than 1/3 of the distance between the base and inlet pipe.

Drywell cleaning should be performed in a way that makes certain removed sediment and water is not discharged back into the storm sewer.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer--cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Work in drywells requires special OSHA-required confined space equipment and procedures. The most practical method for cleaning drywells may be to contract with a sewer-cleaning contractor.

If the drywell does not dissipate stormwater, it should be replaced or repaired.

It is possible to restore some drywell capacity by water-jetting clogged openings.

Another option is installing a new drywell or drainage trench, and converting the clogged drywell into a sediment trap. This has the advantage of providing a sediment trap and some amount of spill trapping. The sediment trap conversion requires grouting the holes, covering the base with concrete, and adding piping.

If there is standing water in a drywell, it probably is into the water table. Drywells in the water table should be rebuilt to prevent stormwater from going directly into groundwater.

Repair all security and access features so they are fully functional. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Drainage Trenches

Drainage trenches are subsurface gravel-lined drain fields built to infiltrate stormwater into the ground. They have a large, perforated pipe in a bed of sorted gravel. Fine, oily sediment can clog drainfields and lead to localized street flooding. Also, pollutants discharged into drainfield can migrate into groundwater. Drainage trenches were often installed in closed topographic depressions, areas with well-drained soils, or areas having inadequate storm sewers.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Some drainage trenches have special inspection wells or clean out manholes. They should be inspected at once a year and no less than once every five years.

A thorough inspection of the observation points should be made if there is a decrease in capacity. Inspection points can include: inspection ports, monitoring ports built into the trench, and water table depth monitoring wells. Water levels in these inspection points can provide information about the performance of the facility.

If there is a problem with flooding or slow drainage, the facility design rate needs to be verified. If there are monitoring tubes in the drain field, use them to observe infiltration rates.

Periodically inspect the surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

If a drainage trench begins to clog, try cleaning the perforated drainpipe.

Cleaning should be performed in a way that makes certain removed sediment and water is not discharged back into the storm sewer.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according the manufacturer's instructions.

Repairs

Repairing a clogged drainage trench will involve excavation and replacement of part or all of the facility.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Infiltration Basins/Ponds

Infiltration facilities dispose of water by holding it in an area where it can soak into the ground. These are open facilities that may either drain rapidly and have grass bases, or have perpetual ponds where water levels rise and fall with stormwater flows. Infiltration facilities may be designed to handle all of the runoff from an area or they may overflow and bypass larger storms.

Since the facility is design to pass water into the ground, anything that can cause the base to clog will reduce performance and is a large concern. Generally, infiltration basins are managed like detention ponds but with greater emphasis on maintaining the capacity to infiltrate stormwater.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O3 Avoid or minimize vegetation removal
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O10 Meet public expectations for aesthetics

Practices

Inspection

Check once per year after a rainstorm to see if the facility is draining as intended. Inspect annually for all features.

A thorough inspection of the observation points should be made if there is a decrease in retention basin capacity. Inspection points can include monitoring ports built into the base of the facility and water table depth monitoring wells. Water levels in these inspection points can provide information about the performance of the facility. It will probably require a licensed professional engineer or other professional trained in hydraulics to interpret the information.

Identify and remove pollutant sources to the facility. Inspect the facility for oil and other pollutants and remove any pollutants greater in volume than a surface sheen.

Cleaning

Trash is removed when it exceeds 1 cubic foot per 1000 square feet.

Remove sediment when it accumulates to 2 inches or if the facility does not drain between storms or meet 90 percent of design capabilities.

If the facility has a sediment trap, clean out the sediment when one-half foot accumulates.

Materials Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Vegetation Management

Mow or control vegetation to match surrounding area or sustain any other intended use of the facility, such as wildlife habitat or recreation.

Stormwater control facilities are, in effect, water body buffers where pesticides and fertilizer are not normally used. See the activity Vegetation Management in Stormwater Control Facilities for details.

Use mechanical methods to control weeds. Pesticides, herbicides and fertilizers are not normally used in stormwater control facilities.

When replacing plantings, use only plants on the list of adopted Clark County Plant List (Ordinance. 1995-01-26) or Vancouver plant list inside Vancouver.

Trees should not be allowed to grow on emergency overflows and berms that are over 4 feet high. Trees can block flows and roots can lead to berm failure. Remove any trees. Remove larger roots (where the base of the tree is greater than 4 inches) and restore the berm.

Trees and shrubbery should be allowed to grow unless they interfere with facility function or maintenance activities. Any cut trees should be salvaged for habitat enhancement or converted to mulch or firewood.

Repairs

If the facility is overflowing for storms it was designed to infiltrate, it needs to be repaired. This requires removing accumulated sediment and cleaning or rebuilding the system so that it works according to design.

Repair and seed bare areas. Repair eroded slopes when rills form, where the cause of damage is still present, or there is potential for future erosion. Use cover BMPs on exposed soils.

Rodent holes on a darn or berm can pipe water. Destroy rodents, preferably by trapping, and repair the dam or berm. Check with the Washington Department of Fish and Wildlife before removing a game animal or fur-bearer, for example muskrat, beaver, nutria.

Spillway areas should be completely covered by more than one layer of rock.

Closed Detention Systems in Tanks or Vaults

Underground tanks or vaults usually are placed under paved areas. They are hold and slowly release stormwater runoff from roofs and pavement.

Tanks and vaults are confined spaces where work requires special OSHA approved training and equipment.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Practices

Inspection

Inspect annually for the features listed under Cleaning and Repairs.

Periodically inspect the facility and surrounding areas for pollutants such as leaks from dumpsters, minor spills, and oil dumping. Take action to have the pollutant source removed.

Cleaning

Remove trash and litter from the vault, inlet and piping.

Clean air vents that have one half of their area plugged.

Remove sediment when it accumulates to 1/10th the depth of a rectangular vault or 1/10th the diameter of a round tank or pipe.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be handled and disposed of in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair any cracked or defective plates or baffles. Cracks are repaired so that no cracks greater than ¼-inch are found.

Any part of a tank or pipe that is bent out of shape more than 10 percent of its design shape must be replaced or repaired.

Repair any joints that are cracked and allow soil into the facility.

Repair all security and access features. This includes locking lids, covers, and ladder rungs.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Flow Control Structures/Flow Restrictors

Flow control structures and flow restrictors direct or restrict flow in or out of facility components. Outflow controls on detention facilities are a common example where flow control structures slowly release stormwater at a specific rate. If these flow controls are damaged, plugged, bypassed, or not working properly, the facility could overtop or be releasing water at too high of a rate. This will likely damage streams habitat and property. Site plans should have detailed drawings showing how the flow control structures should appear. Consult a licensed professional engineer for assistance.

Outcomes

- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O9 Protect infrastructure

Practices

Inspection

Inspect at least once per year for all features listed under Cleaning and Repairs, or when a facility does not drain properly or other problems occur.

Cleaning

Remove sediment within one and ½ feet of the bottom of an orifice plate.

Remove trash and debris that may block the orifice plate.

Remove any trash or debris that may block an overflow pipe-

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer-cleaning contractor.

Material Handling

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Removed sediment must be disposed in the garbage as solid waste. Water should be disposed of in a sanitary sewer after oils are removed using oil absorbent materials or other mechanical means. Used oil absorbents should be recycled or disposed according to the manufacturer's instructions.

Repairs

Repair or replace to original design specification any outlet orifice that is enlarged, bypassed or damaged.

Make certain that overflow outlets are not blocked.

Structures should be securely in place and within 10 percent of vertical.

Repair outlet pipe structures that have leaking connections or holes not specified by the design.

Repair or replace a non-functional or damaged cleanout gate.

Repair or replace damaged orifice plates to original design specification.

No outflow controls can be modified without approval of a Clark County Public Works Department engineer. Modifications may require approval under the Chapter 13.29 Stormwater Controls.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Storm Pipe

Storm sewer pipes convey stormwater. Pipes are built from many materials and are sometimes perforated to allow stormwater to infiltrate into the ground. Storm pipes are cleaned to remove sediment or blockages when problems are identified. Storm pipes must be clear of obstructions and breaks to prevent localized flooding.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Operation and Maintenance Practices

Inspection

Pipes are difficult to inspect requiring special equipment and training. Usually, if a problem occurs the owner needs to call a sewer or plumbing contractor to inspect, repair or clean pipelines.

Cleaning

Clean pipes when sediment depth is greater than 20 percent of pipe diameter. When cleaning a pipe, minimize sediment and debris discharges from pipes to the storm sewer. Install downstream debris traps (where applicable) before cleaning and then remove material.

Generally, use mechanical methods to remove root obstructions from inside storm sewer pipes. Do not put root-dissolving chemicals in storm sewer pipes. If there is a problem, remove the vegetation over the line.

Cleaning or excavating a pipe or culvert within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses (e.g., Curtin Creek, China Ditch, etc.) may also require an HPA. Consult the official state DNR water type maps for assistance in determining whether watercourses are typed streams (e.g., type 1, 2, 3, 4 or 5) that are regulated by WDFW. Contact WDFW Region Five office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Region Five Vancouver Office (360) 696-6211, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

Safety

Work inside underground structures requires special OSHA-required confined space equipment and procedures. The most practical option may be to contract with a sewer--cleaning contractor.

Materials Handling

Sediment and debris from pipes should be disposed in the garbage as solid waste. Pick out any rocks first.

Repairs

Repair or replace pipes when a dent or break closes more than 20 percent of the pipe diameter.

Repair or replace pipes damaged by rust or deterioration.

Follow the practice described under the Activity: Installation, Repair and Replacement of Enclosed Drainage Systems.

Dry Drainage Ditches

Ditches are manmade open channels that carry only stormwater. This does not include ditches that have water flowing in them during dry weather.

Ditches are often maintained for drainage to prevent localized flooding by draining stormwater. Maintenance includes removing sediment, debris and overgrown vegetation.

Protecting water quality dictates minimizing vegetation removal and preventing erosion.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O3 Avoid or minimize vegetation removal
- O4 Preserve native plants
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Practices

Inspection

Inspect ditches during routine site maintenance or at least once per year.

Cleaning

Land disturbing activities that remove vegetation or disturb soil are subject to erosion control requirements of Chapter 13.29 Stormwater Controls. A good time to clean is during the growing season, when it's easiest to reestablish vegetation. This is generally April through June and September through October.

Cleaning or excavating stormwater facilities within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses (e.g., Curtin Creek, China Ditch, etc.) may also require an HPA. Consult the official state DNR water type maps for assistance in determining whether watercourses are typed streams (e.g., type 1, 2, 3, 4 or 5) that are regulated by WDFW. Contact VTDFW Region Five office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Region Five Vancouver Office (360) 696-6211, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

If feasible, remove small amounts of sediment by hand when performing routine site maintenance.

Vegetation should only be removed when it reduces free movement of water through the ditch. Never remove more vegetation than is absolutely needed.

Only remove sediment when it reaches 20 percent of the ditch depth or affects the historic or designed hydraulic capacity.

Alternate cleaning areas with undisturbed areas, leaving undisturbed sections to act as sediment-trapping filters between worked areas.

Trap sediment that is generated by ditch maintenance to keep it from entering water bodies. Use sediment-trapping BMPs such as fabric fencing or filter bags at the lower end of each excavated area

Prevent sediment from eroding when ditch work is performed. Perform work during dry weather unless there is an emergency such as property or road flooding.

Vegetate bare soils by hydroseeding or cover bare soils with an approved BMP. Hand seed for smaller areas.

Water-Bearing (base flow) Drainage Ditches

Many manmade drainage ditches carry water when it is not raining. This water comes from groundwater seeps and wetlands. These ditches can be recognized by the presence of wetland plants such as cattails. Any work that disturbs these channels is probably subject to a variety of environmental regulations and will probably require an HPA permit from the Washington Department of Fish and Wildlife.

Water-bearing drainage ditches require permits for work. Requirements of county, state, and federal laws and permits may apply. Contact the Washington Department of Fish and Wildlife and the Clark County Department of Community Development before beginning work.

Storm Sewer Maintenance Activities

Installation, Repair and Replacement of Enclosed Drainage Systems

This activity includes tasks such as repair and replacement of pipe, catch basins, drywells and manholes. It also includes drainage projects that add new pipes, catch basins, or infiltration structures. New drainage projects are subject to regulations under Chapter 13.29 Stormwater Controls. Source control BMPs are required for activities such as concrete cutting.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming
Pollutant sources
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding

Practices

Avoid or minimize vegetation removal. If work is near a stream or wetland, there are regulatory requirements under Chapter 13.36 Wetlands Protection or Chapter 13.51 Habitat Conservation.

Follow any construction permit requirements of the Stormwater Control Ordinance, Chapter 13.29 CCC.

If work is performed under contract, specify BMP performance under inspection/contract administration.

Prevent debris, oils, cleaning agents, and sediment from entering waterways.

Avoid or minimize work in wet weather. This will reduce the problems of containing sediment.

Carry spill control kit to contain and clean up possible small spills in the work area.

Protect storm drains.

- Cover storm sewer inlets, catch basins and open manholes to block sediment-bearing water.
- If runoff contains sediment, use gravel-filled filter bags or an equivalent product to build berms around inlets. Gravel-filled bags are more stable than chip-filled bags.
- Catch basin inserts are also an acceptable sediment trapping option.

At stream crossings, trap materials using screens or another form of containment. Use containment BMPs to protect roadside ditches during wet weather.

Avoid using water to clean up work sites. Sweep or vacuum dust and debris from the repair job. Do not wash materials into storm sewers.

Place stockpiles away from drainage ways, wetlands, and natural wetland and habitat buffers. Cover stockpiles or contain them with berms or other containment devices if there is a chance that materials will erode into a storm drain or water body.

Cleaning or excavating a stormwater facility within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses (e.g., Curtin Creek, China Ditch, etc.) may also require an HPA. Consult the official state DNR water type maps for assistance in determining whether watercourses are typed streams (e.g., type 1, 2, 3, 4 or 5) that are regulated by WDFW. Contact WDFW Region Five office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Region Five Vancouver Office (360) 696-6211, or the Statewide Emergency Hotline HPA Hotline (360) 902-2537.

Minor Culvert Repair (not in a stream)

This activity is the replacement or repair of culverts and inlets less than 6 feet in diameter. It applies only to structures that are in ditches but specifically for drainage that do not carry water during dry weather. If there is any question about whether the ditch is a storm drain or a stream consult, with the Washington Department of Fish and Wildlife.

Outcomes

- O1 Avoid or minimize sediment and pollutant discharges from the work area
- O3 Avoid or minimize vegetation removal
- O7 Maintain or restore the intended infrastructure function
- O8 Prevent or reduce flooding
- O9 Protect infrastructure

Practices

Comply with stormwater and erosion control requirements of Chapter 13.29 Stormwater Controls.

Avoid or minimize vegetation removal. If work is near a stream or wetland, there are likely regulatory requirements under Chapter 13.36 Wetlands Protection or Chapter 13.51 Habitat Conservation.

Other than to address a threat to public safety or property due to flooding, perform work during the dry season.

Minimize soil disturbance.

Use sediment controls to trap any sediment and prevent sediment from entering storm sewer and water bodies. Sediment trapping BMPs are used to the extent practical during emergencies.

Use cover BMPs to prevent erosion of bare soil. Vegetate bare soils.

Cleaning or excavating a stormwater facility within natural or altered streams will likely require an HPA from WDFW. Work within seasonally dry or ditched watercourses (e.g., Curtin Creek, China Ditch, etc.) may also require an HPA. Consult the official state DNR water type maps for assistance in determining whether watercourses are typed streams (e.g., type 1, 2, 3, 4 or 5) that are regulated by WDFW. Contact WDFW Region Five office for additional information on whether specific watercourses are regulated under the State Hydraulic Code, or if unmapped streams are encountered.

If there is an emergency (e.g., immediate threat to life or property, or threat of environmental degradation), a verbal HPA may be obtained by calling the Washington Department of Fish and Wildlife Region Five Vancouver Office (360) 696-6211, or the Statewide Emergency Hotline I-IPA Hotline (360) 902-2537.

Major Culvert Repair (at a Stream Crossing)

This activity is the replacement or repair of culverts and inlets greater than 6 feet 'in diameter or bridging a stream or ditch with flowing water during dry weather. If there is any question about whether the ditch is a storm drain or a stream consult with the Washington Department of Fish and Wildlife and the Clark County Department of Community Development.

These projects must meet all regulatory requirements.

- SEPA
- Shoreline Management
- State HPA
- Flood Plain

Pavement Sweeping

Sweeping is performed to remove sand and litter from streets and curb gutters. Sweeping also reduces dust during dry weather. Street sweeping is also storm sewer maintenance practice because it limits sediment washed into stormwater facilities. Water quality practices for street sweeping focus on sediment disposal. Reducing the amount of sediment washed into catch basins, detention facilities, drywells, and other facilities can save money because sweeping is generally cheaper than removing sediment from facilities. Sweeping also helps protect facilities from clogging with sediment.

Outcomes

- O2 Prevent parking areas, roads, drainage systems, facilities and property from becoming pollutant sources
- O5 Protect public safety and health
- O10 Meet public expectations for aesthetics

Practices

Sweep the site if it will help keep sediment and from storm sewers or water bodies. Sweeping is especially useful for cleaning up work areas.

Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations, including the Minimum Functional Standards for Solid Waste Handling Chapter 173-304 WAC; guidelines for disposal of waste materials; and where appropriate, Dangerous Waste Regulations, Chapter 173-303 WAC.

Sweepings should be disposed of as solid waste or under a program permitted by the Southwest Washington Health District.

Vegetation Management

The following practices are adapted, with minor modifications for format and local practices, from City of Portland Parks Pest Management Policy (April 1999).

General Goals and Philosophy

Clark County recognizes the special importance of the rivers, streams, wetlands, ponds, and stormwater control and treatment facilities. The sensitive nature of such habitats, their plant and animal communities, and their direct link with other waterways require that we establish specific policies to ensure their health. All landscape management decisions for controlling unwanted vegetation, diseases, and pests should follow Integrated Pest Management principles and decision-making rationale. These are:

- Proper planning and management decisions begin the IPM process.
- Cultural methods of vegetation and pest control are preferred and are first employed.
- Mechanical means of vegetation and pest control are next in line of preference, and are utilized where feasible.
- Biological methods of vegetation and pest control are considered before chemical means, where they are feasible.
- Botanical and synthetic pesticides are used only when no other feasible methods exist.

General Practices

Use Only Appropriate Plants

Clark County has adopted a list of approved plants for use in development projects. The list also has prohibited undesirable plants. Only plants approved for use in the Clark County Plant List are allowed for use in plantings in unincorporated areas.

Mulching

Mulches and other ground coverings are useful during the installation and restoration of landscapes as well as their ongoing maintenance. Mulches meet a variety of needs. They suppress weeds, help to retain moisture around plants, reduce possible erosion, and provide visual enhancement.

Always consider the possible impacts when using mulches, which may include:

- Inadvertent introduction of non-native weeds and diseases to the site.
- Leaching of substances such as tannins from the mulch into nearby waterways.
- Migration of mulch material into waterways.
- Nutrient leaching into waterways.

Vegetation and Pest Management in Stormwater Control

Facilities

Stormwater control facilities include biofiltration treatment swales, treatment wetlands, treatment ponds, detention ponds, open channels, and infiltration basins. Stormwater control facilities discharge to surface water or groundwater either directly or through pipes or ditches. Many facilities are built to remove pollutants from stormwater.

Generally, vegetation should be maintained to blend into surrounding areas. Stormwater facilities can provide habitat for aquatic life and birds. Promoting natural vegetation where feasible improves habitat. Swales often blend into intensively managed landscapes. Pond perimeters can *include natural vegetation.

The use of pesticides and, in most cases fertilizer, is not compatible with the task of pollutant removal or the direct connection of stormwater facilities to streams and groundwater.

Features of Stormwater Facilities:

- There is a mix of native and non-native plants
- Generally not used by the public
- Include areas managed to promote design function, such as turf in swales
- Managed landscapes may be nearby
- May be used by fish and wildlife

Objectives for Stormwater Facilities:

- Maintain healthy plant communities
- Avoid or minimize need for chemical intervention
- Control invasive plants where feasible
- No bare soil areas are allowed
- Tolerance for natural appearance and weeds

Practices

The vegetation management focus is establishing and maintaining healthy low-maintenance native plantings and sustaining the design function of vegetated filters such as biofiltration swales. This includes controlling invasive plants where feasible, and planting cover on bare soils.

Only use plants on the City of Vancouver plant list or the Clark County Plant List (Ordinance 1995-01-26).

In some cases, the original plantings may not be appropriate for the actual condition at a facility. One example is a frequently flooded swale that cannot support normal turf. In cases like this, replace turf with appropriate wetland plants if the underlying drainage problem cannot be fixed.

Consider the use of soil amendments such as compost before using fertilizer.

Limit mulch use to covering bare soil while establishing plantings.

Chemical use should be avoided within 25 feet of any area that holds or conveys surface water or stormwater. This includes the base of a biofiltration swale.

Trees or shrubs that block access roads may be trimmed (or removed if within the access road) at the time of when access is required for maintenance by heavy equipment.

Trees that pose a risk to stormwater structures due to root growth may be removed and replaced by smaller shrubs.

Vegetation and Pest Management in Stormwater Facility Wetland Areas

Wetlands are built to treat stormwater. As water bodies, treatment wetlands connect to streams and groundwater. Wetlands also host insects, fish, amphibians, and birds that are sensitive to horticultural chemicals. Because of this, chemical use should be avoided or minimized in wetland buffers. Wetland management has a low tolerance for invasive or nonnative plants.

Practices listed here only apply to parts of wetlands that are not subject to inundation or saturation during the growing season.

Noxious weed controls by the Weed Management Department may include herbicide use in wetlands.

Features of Constructed Wetlands:

- Limited public access
- Plants may or may not be well established depending on age and condition
- May provide fish and wildlife habitat

Objectives for Constructed Wetlands:

- Maintain healthy plant communities
- Avoid or minimize need for chemical intervention
- Low tolerance of invasive plants, non- natives
- Bare soil areas are not allowed

Practices

There should be a plan for establishing and maintaining vegetation in a newly created wetland facility. If there is a plan, follow it. If there is not a plan, follow these practices. Maintenance focuses on establishing and sustaining healthy native plantings. This includes more vigorously controlling invasive plants. It also includes covering for bare soils.

Only use plants on the Clark County Plant List (Ordinance 1995-01-26).⁷

Consider the use of soil amendments such as compost before using fertilizer.

Limit mulch use to covering bare soil while establishing plantings.

Chemical intervention is minimized and is avoided if possible within 25 feet of areas subject to inundation during the growing season.